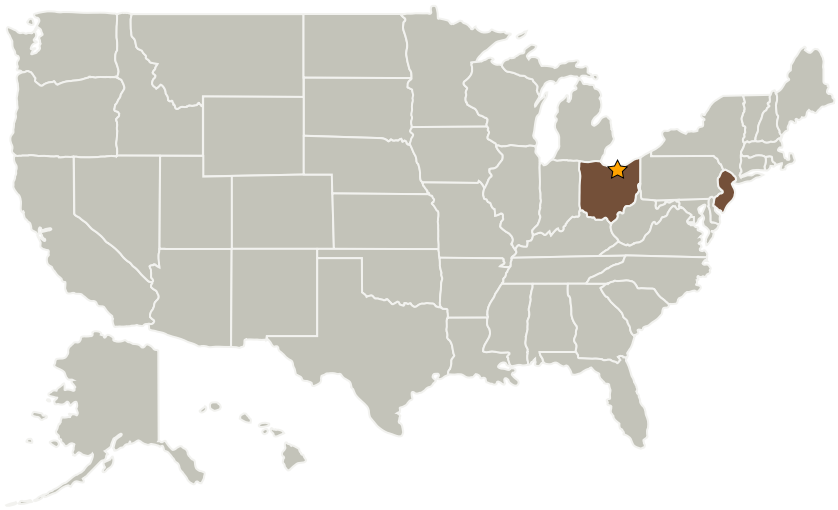
High Temperature Shape Memory Alloy Technology for Inlet Flow Control, Phase I

Completed Technology Project (2008 - 2008)

Project Introduction

Recent advances have strengthened interest in supersonic cruise aircraft, though achieving economic viability for these vehicles will require dramatic improvements in cruise efficiency without excessively penalizing off-design performance. Optimization of inlet design offers a potent method for achieving these goals, and a range of flow control concepts are available that can provide an adaptive ability to minimize blockage, reduce boundary layer bleed, and mitigate adverse effects of flow distortion on inlet/engine stability. By exploiting high temperature smart materials technology, these concepts can be mechanized in robust, compact, and lightweight devices, enabling actuators suitable for the environment of supersonic powerplants. This effort will demonstrate the feasibility of applying High Temperature Shape Memory Alloy (HTSMA) technology to this problem, focusing initially on design and demonstration of variable geometry flow control devices for use in supersonic mixed compression inlets. The project will build on prior successful development of smart materials actuators, and will extend earlier work by incorporating new HTSMA materials as well as by exploiting recent insights into microramp and vortex generation devices. The project will include refinement and characterization of actuator-ready HTSMAs, development of design tools for aero/thermo/structural analysis of flow control concepts, and experiments on demonstrator-level implementations.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Continuum Dynamics, Inc.	Supporting Organization	Industry	Ewing, New Jersey

Primary U.S. Work Locations	
New Jersey	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Todd Quackenbush

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions